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C3 Balance and Operational Art

by

Kevin B. Jordan

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Joint Military Operations Department.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: K B Jordan

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Paper directed by
Captain George Jackson, USN
Chairman, Department of Joint Military Operations

I.P. T Gallagher

Captain Thomas Gallagher, USN
Faculty Adviser

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Date

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15.Abstract: This paper considers Operational art within the lager context of "all art," as defined by Aristotle, in which balance is crucial to artistic expression. The paper recommends ways of employing the C3 system to balance creativity and constraint in pursuit of Operational art. The focus is on employing Expert Systems as information buffers as a means of adjusting information flow in advanced C3 systems to that level which best serves the commander's needs under the given circumstances.

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The term operational art, as applied to the business of war at the theater level, implies something more than the assembly of means and their systematic application toward an objective purpose or end. The systematic approach, if devoid of insight and an imaginative employment of resources, leads to indecisive results through pitting strength against strength, and to the high casualty rates associated with attrition warfare. Operational art enables the commander to apply strength against weakness to achieve decisive results at less cost in lives, materials, and time. The practice of operational art requires intuitive understanding, an essentially artistic perception.

Art transcends, though it can never contradict, logic through the faculty of human intuition. Aristotle noted that "All art is concerned with coming into being, i.e. with contriving and considering how something may come into being."[1] Artistic expression, in the Aristotelian sense, involves "true reasoning," a logical expression of ideas which reveals truth.[2] It is an interactive process whereby the cognitive function of consideration leads to intuitive understanding. And the manipulative function of contriving with the materials results in their transformation, giving substance to the artist's vision of that which is to be brought into being. Operational art is achieved when the commander, aided by intuitive understanding, is able to discern the truth of the enemy's situation, i.e. his essential strengths and vulnerabilities, and then bring into being an arrangement of forces and circumstances that make the most of this discovery.

The practice of operational art requires a Command, Control, and Communication (C3) system that serves the interplay between the cognitive and manipulative functions of artistic expression, between the considering and the contriving. A system that is appropriately balanced makes possible a subtle dexterity in this interaction, whereby the means become the direct expression of the Commander's will or vision. If a C3 system favors the cognitive over the manipulative or vice versa, the balance is lost, the commander's ability to envision and influence are degraded, and artistic expression is no longer possible.

The idea that balance is crucial to the effectiveness of a C3 system is not so surprising if one considers the system in the context of its functional contribution to what is essentially an artistic effort. Balance, or the appeal of that which is proportional, is at the very heart of aesthetics, the branch of philosophy concerned with appreciation of nature and the creation of art. Artistic expression is a natural phenomenon, an example of man acting within his element in the fullness of human capacity.[3] Balance serves artistic expression in the same way that it serves nature in the management and control of the natural environment; it is the root of order. Natural systems, including human social systems, from the microscopic to the cosmic are ordered or regulated through feedback loops that seek dynamic equilibrium.[4] The C3 system serving a theater commander is also self-regulating in the natural way by means of feedback,

but in order for it to perform optimally, the balance must be set at the right level, the system must be tuned.

Before discussing the tuning of the C3 system, we must first identify its essential components. Modern C3 systems consist of a commander, his or her staff, an organizational structure encompassing assigned forces, and means of communicating or exchanging information among the elements of the organization. The commander, staff, and organized forces constitute the exclusively human dimension of the C3 system, concerned with functions of command and control. The third C, the communication means, is a hybrid enterprise, composed of both human and machine elements, the sole purpose of which is to facilitate command and control. Joint doctrine has recently tacked on a fourth C, representing computer systems, to the C3 acronym.[5]

While the emergence of the fourth C is intended to underscore the growing influence of the digital computer in the "American way of war," its addition to the acronym is at best redundant and at worst a misleading distortion that obscures the importance of balance. Computers facilitate the process of command and control through the storage, transmission, and manipulation of data. Their contribution remains entirely within the domain of the third C because they are incapable of intuitive reasoning, they merely support the human capacity to employ it.

Tuning a C3 system to serve the purpose of operational art requires that we keep in mind the cognitive and manipulative processes of artistic expression, the interplay between

considering and contriving. And, that we recognize that this interaction is a feedback loop whereby the one influences the other. Balance requires that we determine the right level at which the commander's ability to assimilate information and draw valid conclusions is matched by the system's ability to provide relevant data.

One problem with feedback loops, and the reason balance is so important both in natural and manmade systems, is that they can reach equilibrium at different levels depending on the amount of energy in the system.[6] The commander's ability to assimilate information is limited by factors of experience, environmental circumstances, and time. Demand for pertinent information to support intuitive understanding generates increased information flow. Computer based information technology tends to accentuate this feedback process, increasing the level of energy in the system and eventually overwhelming the commander's capacity to digest the information provided.[7] To support the commander in achieving operational art, the C3 system must be responsive to his or her requirements under the given circumstances.

Communications theorists E.M. Eisenberg and H.L. Goodall have described communications as the process through which organizations balance the tensions generated by the opposing requirements to promote creativity or change on the one hand, and to recognize constraints in the interest of order on the other.[8] Their model for communications balance, shown in Figure 1, is really a representation of the Aristotelian concept for artistic

expression. Creativity, the product of intuitive thinking, is balanced against constraint, the necessity of contriving within available means to give form to artistic vision.

Communications

Balancing Creativity and Constraint

Figure 1

Eisenberg's and Goodall's idea that communications serves an organization's need to balance creativity and constraint suggests that the C3 system can be tuned to support operational art by favoring one over the other, consistent with the commander's needs under the given circumstances. For example, communications media that enhance creativity (a crucial function of command) are more important during plan development, while media that support contriving with available materials (the processes of control) are more important during execution. Tuning the C3 system requires adjusting the pivot point or balance to favor either creativity or constraint, i.e. the cognitive or manipulative processes of artistic expression, as the situation warrants.

The question of balance, of finding the right level of information exchange at which the C3 system best serves operational art, is not necessarily a question of quantity. A C3 system that provides too much data may well be less effective than one that offers too little, given that the information

available in the deficit situation is sufficient to permit the human capacity for intuition to bridge the shortfalls. Commanders should not expect to have all pertinent information before making a decision.[9] Ideally, commanders need only enough information to draw valid conclusions. An experiment conducted during a Naval War College war game supports this observation.

One out of three messages was randomly selected and withheld from student commanders during the conduct of the game. Observers noted better overall performance from student commanders with access to fewer messages.[10] This result suggests that operational proficiency of commanders is degraded by C3 systems that push more data than is needed under the circumstances. It also suggests that more effective filtering or packaging of data may help to restore balance at a level suitable to the commander's needs.

The performance of the student commanders and the results of empirical studies suggest that the information content of data is more important than volume, and that the type of media employed determines the information content or "richness" that can be readily conveyed.[11] Information richness has been defined by communications researchers R.L. Daft and R.H. Lengel as the potential information carrying capacity of data.[12] They cite Lengel's work in proposing a continuum for the information richness of media shown in Figure 2.

Information Medium		Information Richness	Feedback
Face-to-Face	*	Highest	Immediate
Telephone	*	High	Fast
Written, Personal (letters, memos)	*	Moderate	Slow
Written, Formal (Documents, Bulletins)	*	Low	Very Slow
Numeric, Formal (computer output)	*	Lowest	Very Slow

Communication Media and Information Richness

Figure 2

According to Daft and Lengel, the position of a communication medium along the continuum is determined by the immediacy of feedback it offers the sender.[13] Although Lengel's continuum is dated because it does not include such widely used media as video teleconferencing, facsimile, and electronic mail, we can readily determine where they would fit in based upon their potential to elicit prompt feedback from the receiver. Recent developments in information technology, with significant potential to encourage intuitive understanding, include decision support systems and artificial intelligence (AI) based knowledge systems.[14] Such "expert systems," designed to provide commanders with enhanced situational awareness, would rate very highly on the information richness scale because of their ability to convey subtlety and nuance through immediate feedback.

Daft and Lengel also note that the richer the communication medium, the greater the potential for differing interpretations, while media low in richness are more suitable for conveying precision.[15] This observation may seem paradoxical. Nevertheless,

the very qualities that make a medium rich, the ability to convey subtlety and nuance, also render its content subject to interpretation at different levels of understanding. Conversely, the least information rich medium, mathematical expression, is the most precise because it offers no potential for differing interpretation, i.e. it can have only one meaning. This distinction is important because a C3 system designed to support operational art must incorporate diversity of media to accommodate both extremes.

Balancing the C3 system requires us to understand the distinction between information rich media and their propensity to generate differing interpretations, and media low in information richness and their suitability for conveying precision. The commander needs access to both to achieve operational art. The former is essential to intuitive reasoning, while the latter serves the process of contriving, the logical ordering of the trillions of bits of data inherent in moving, sustaining, and fighting Joint Forces. Intuitive reasoning (the language of art) addresses the problem as a whole, while abstract reasoning (the language of the computer) addresses parts of the whole, one bit at a time.

Leaders naturally turn to intuitive reasoning to make sense out of complex problems, especially those with unpredictable human social dimensions. They seek out information rich media to provide them with the "cues" to understanding that immediate feedback and nuance offer.[16] The word "cue" implies that

information rich media prompt the intuitive process, that they trigger the mind to find order in chaos, to make sense out of unpredictability. Information rich media are indispensable to artistic expression because they encourage intuitive reasoning. They help the artist make sense out of uncertainty and change.

Clausewitz described war as the realm of chance.[17] Aristotle noted the connection between chance and art: "Art loves chance and chance loves art."[18] Clearly, the link between war and art is the centrality of chance. It is chance, particularly that arising from the enemy's potential for unpredictable behavior, that casts war in the realm of art rather than the realm of science. It is the necessity of contending with chance that draws managers to information rich media, and commanders toward the front, in an effort to form an intuitive understanding of the overall picture.

On 29 June 1950, a few days after the North Korean Army invaded the South, General MacArthur visited the front near Seoul. William Manchester's description of MacArthur surveying the battlefield, drawn from first hand accounts of those accompanying the general, provides a most revealing image of the process of intuition at work.

> "Like Napoleon at Ratisbon, MacArthur stood on a little mound just off the road, clogged with retreating, panting columns of troops interspersed with ambulances filled with the groaning, broken men, the sky resonant with shrieking missiles of death and everywhere the stench and misery and utter desolation of a stricken battlefield."[19]

MacArthur was on that mound because he was seeking understanding. He was interested in the sights and smells of the

battlefield, the sort of information or cues to understanding that can only be conveyed through subtlety and nuance, the sort of information that can only be gotten through "Face to Face" or other information rich interaction. It was some time later that he revealed that it was during the twenty minutes spent on the knoll that he conceived of his amphibious triumph at Inchon.[20]

Ulysses S. Grant has been described as the first great modern general.[21] He is worthy of this distinction not because he won victories with what was essentially a modern army, employing such technological advances as rail roads, telegraph communications, and rifled artillery. Grant's distinction as a great modern commander lies in his ability to view war as an integrated whole, an essentially artistic perception, and in his recognition of the importance of C3 to concerted effort on the theater level. It is interesting to note that Grant would only accept his appointment as General in Chief of the Armies of the United States on the condition that he not be required to maintain his headquarters in Washington.[22] He recognized the importance of information rich media to intuitive understanding and located his headquarters with the fighting forces to ensure his access to it.

Grant's appreciation of the importance of C3 to operational art is also evident in the fact that he was the first general to form a modern staff capable of planning at the operational level of war.[23] He employed his C3 system (commander close to the action, an effective staff of technical experts, and an extensive

telegraph and rail network) to design and execute a campaign plan that brought the superior strength and mobility of the Union forces to bear across the entire front, sealing the fate of the Confederacy despite the tactical brilliance of Robert E. Lee. Grant was the first commander to recognize the full potential of a modern C3 system to facilitate intuitive understanding and direct coordinated action.

Grant's concept for crushing the Confederacy could neither have been conceived of nor executed without his C3 system. The development and implementation of his plan is an example of how the interplay between considering and contriving, the balance between creativity and constraint, is maintained through a C3 system adapted or tuned to the commander's needs. But Grant's idea, his artistic vision, was difficult to comprehend by those unaccustomed to thinking about war on the theater level. Nevertheless, President Lincoln was quick to perceive its merit and offered a riveting analogy which Grant later used to explain the plan to his subordinates. In referring to Grant's concept, Lincoln succinctly described the relationship between attacking and advancing Union armies as, "Those not skinning can hold a leg."[24]

Lincoln's analogy crystallized Grant's concept into a shared vision that was readily understood throughout the Union forces. Because Grant's idea was intuitive, an artistic insight into how to defeat a superbly led, highly skilled, and resourceful enemy, it was subject, as is all art, to differing interpretations.

Lincoln's adept analogy, however, made it graphically clear. It provided the "context for understanding" and demonstrates the power of a shared vision in helping to clarify the commander's intent.[25] The context for understanding that serves to clarify the commander's intent can also help to focus information needs, the first step in tuning the C3 system.

Tuning the C3 system to serve operational art in the information age may require that we reduce the amount of energy in the system. Excess information volume, a result of the feedback process, is driving dynamic equilibrium to levels well beyond the human capacity to cope. Recent developments in Chaos Theory suggest that feedback systems become increasingly unstable at higher levels of energy and underscore the need to get control of the information technology systems that dominate our command and control structures.[26]

While modern weapons, transportation, and surveillance technologies preclude our taking a nostalgic step backward in an attempt to recapture the utilitarian simplicity of Grant's C3 system, perhaps he has something to offer nonetheless. Grant's staff of functional area experts served to insulate him from the distraction of information detail while providing him with the distilled knowledge essential to decision making. Management science researchers have recognized the importance of providing information buffers to protect senior decision makers from information overload in advanced C3 environments.[27] Expert systems serving as information buffers can provide current

information on demand without flooding the commander and staff with information not needed at the moment. An analogy that Lincoln, a former Mississippi boatman, would have readily understood might help to clarify the function of information buffers in tuning the C3 system. Expert systems can serve to absorb the energy of information flow much like the eddies and wet-lands of the Mississippi valley absorbed the excess capacity of the "Father of Waters" a century ago, filtering and returning it to the main stream when the water level dropped.

Our current C3 system is much like the Mississippi today at flood stage. Stripped, through the construction of dikes and the draining of swamps, of the natural buffer and filter systems that once kept the silt under control and the energy in the system at a balance determined by nature, the river has become a raging torrent, increasingly more difficult to predict or manage. Use of expert systems as information buffers would enable us to get control of the information torrent by matching the level of information flow to that needed to support the commander's requirement for intuitive thinking and the staff's requirement for effective control. Use of expert systems as information buffers would in effect be using communications to balance creativity and constraint as shown in Figure 1.

After bringing the equilibrium of the C3 system to a level that supports rather than impedes the commander's pursuit of operational art, our attention should be shifted to improving his or her capability for remote sensing. Management science

researcher and Nobel Laureate H.A. Simon believes that humans learn best through the primitive senses of sight, smell, and touch, and that these sensations can be simulated through artificial intelligence (AI) systems.[28] We need to devise an AI system that has the information richness to convey subtlety and nuance, probably through virtual reality simulation, that would permit the commander to figuratively mount the hill near Seoul. Whether the commander could learn what MacArthur learned would depend in large measure on experience and practice, the price the artist has always paid for mastery.

Experience and practice are also essential to reducing the commander's vulnerability to deception, a significant risk of relying on information rich media to enhance intuitive understanding. Information technology researchers have postulated that reliance on information rich media, particularly information buffer systems employing automated data bases, increases the decision maker's susceptibility to deliberate efforts at misrepresentation.[29] While it would have been very difficult for the enemy to have arranged a deception to fool MacArthur on his vantage point near Seoul, deceiving a commander who is remotely sensing a distant battlefield is another matter. The ability to convey subtlety and nuance, the qualities that make information rich media useful in prompting intuitive understanding, also make them ideal conduits for misinformation. The more convincing deception efforts, the more artful in design, will target the

commander through multiple paths. Separating truth from fiction will require experience and practice in employing rich media.

We must design our expert systems in such a way as to make the enemy's task more difficult. Some means of cross referencing data will be essential in guarding against the multiple path attack. We must also take steps to deny the enemy access to the commander's history of information processing behaviors which might offer an ideal blueprint for framing a deception effort.[30] If we are to employ information technology to throw the enemy off balance, we must ensure that the computers that define the fourth C are not turned against us for the same purpose.

The pursuit of art is the search for balance. This is true whether the artist wields a sculptor's knife or a general's saber. Tuning the C3 system involves employing communications, including the dimension of the fourth C, to balance creativity and constraint and thus allow the commander to use the saber to best advantage. In the interest of balance, and for the sake of clarity, we should drop the fourth C from C4. The crucial contribution of the digital computer is inextricably bound with the overall function of communications, in which it plays the pivotal role in balancing creativity and constraint, the interactive process of considering and contriving, through which operational art becomes possible.

NOTES

1. Richard McKeon, ed., The Basic Works of Aristotle (New York: Random House 1941), 1025.

2. Ibid., 1025.

3. John Herman Randall Jr., Aristotle (New York: Columbia Univ. Press 1960), 274.

4. Major Glenn E. James, USAF, "Chaos Theory: The Essentials for Military Applications," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1995, 129.

5. Joint Pub 6-0, Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations (Washington, D.C.: 1995), I-1.

6. Maj Glenn E. James, USAF, "Chaos Theory: The Essentials for Military Applications." 23.

7. Herbert A. Simon, "Information Technologies," The Accounting Review, July 1990, 662.

8. Eric M. Eisenberg and H.L. Goodall Jr., Organizational Communications: Balancing Creativity and Constraint (New York: St Martin's Press 1993), 32.

9. Adolf Von Schell, Battle Leadership (Columbus: The Benning Herald 1933), 55.

10. Major Glenn E. James, USAF, "Chaos Theory: The Essentials for Military Applications." 88.

11. Janet Fulk and Charles Steinfield, ed., Organizations and Communications Technology (New York: Sage Publications 1990), 97.

12. L.L. Cummings and Barry M. Staw, ed., Information and Cognition in Organizations (Greenwich, CT: Jai Press Inc. 1990), 248.

13. Ibid., 249.

14. George P. Huber, "The Nature and Design of Post Industrial Organizations." Management Science, August 1984, 936.

15. L.L. Cummings and Barry M. Staw, ed., Information and Cognition in Organizations, 251.

16. Ibid., 252.

17. Carl Von Clausewitz, On War (Princeton, NJ: Princeton Univ. Press 1976), 101.

18. Richard McKeon, ed., The Basic Works of Aristotle, 1025.

19. William Manchester, American Caesar (Boston: Little, Brown and Co. 1978), 554.

20. Ibid., 555.

21. T. Harry Williams, Lincoln and His Generals (New York: Vantage Books 1952), 314.

22. Ibid., 298.

23. Ibid., 313.

24. Ibid., 308.

25. Eric M. Eisenberg and H.L. Goodall Jr., Organizational Communications: Balancing Creativity and Constraint, 36.

26. Major Glenn E. James, USAF, "Chaos Theory: The Essentials for Military Applications." 118.

27. George P. Huber, "The Nature and Design of Post Industrial Organizations." 944.

28. Herbert A. Simon, "Information Technologies." The Accounting Review, 664.

29. Janet Fulk and Charles Steinfield, ed., Organizations and Communication Technology, 110.

30. Ibid., 110.

BIBLIOGRAPHY

Clausewitz, Carl Von, On War. Princeton: Princeton Univ. Press, 1976.

Cummings, L.L. and Staw, Barry M., ed. Information and Cognition in Organizations. Greenwich: Jai Press Inc., 1990.

Eisenberg, Eric M. and Goodall, H.L. Jr., Organizational Communications: Balancing Creativity and Constraint. New York: St Martin's Press, 1993.

Fulk, Janet and Steinfield, Charles, ed. Organizations and Communications Technology. New York: Sage Publications, 1990.

Huber, George P., "The Nature and Design of Post Industrial Organizations." Management Science, August 1984.

James, Major Glenn E., USAF, "Chaos Theory: The Essentials for Military Applications." Unpublished Research Paper, U.S. Naval War College, Newport, RI, 1995.

Manchester, William, American Caesar. Boston: Little, Brown and Co., 1978.

McKeon, Richard, ed. The Basic Works of Aristotle. New York: Random House, 1941.

Randall, John Herman Jr., Aristotle. New York: Columbia Univ. Press, 1960.

Simon, Herbert A., "Information Technologies." The Accounting Review, July 1990.

Schell, Adolf Von, Battle Leadership. Columbus: The Benning Herald, 1933.

Williams, Harry T., Lincoln and His Generals. New York: Vantage Books, 1952.

_____. Joint Publication 6-0, Doctrine for Command, Control, Communications, and Computer (C4) Systems to Support Joint Operations. Washington, D.C., 1995.